

**ENVELOPE COMPONENT APPROACH****(Page 1 of 4) ENV-2C**

Project Name:

Date:

Climate Zone:

**EXTERIOR ROOFING PRODUCT (COOL ROOFS)** - See Section 3.3 in the *Nonresidential Manual* and §118(i) and §143(a)1A in the *Energy Standards* for further description about exterior roofs and mandatory requirements for Cool Roofs.

(Note if the roofing product is not CRRC certified, this compliance approach cannot be used). Go to Overall Envelope Approach or Performance Approach.

**CHECK APPLICABLE BOX BELOW IF EXEMPT FROM ONE OF THE ROOFING PRODUCT MINIMUM PRESCRIPTIVE REQUIREMENTS:**

☐ Roofing compliance not required in Climate Zones 1 and 16 with a Low-Sloped. 2:12 pitch or less.

☐ Roofing compliance Not Required in Climate Zone 1 with a Steep-Sloped with less than 5 lb/ft<sup>2</sup>. Greater than 2:12 pitch.

☐ High-rise residential buildings and hotels and motels with low-sloped roofs in Climate Zones 1 through 9, 12 and 16 are exempted from the low-sloped roofing criteria.

☐ Low-sloped Wood framed roofs in Climate Zones 3 and 5 are exempted solar reflectance and thermal emittance or SRI that have a U-factor of 0.039 or lower. See Opaque Surface Details roof assembly below, Column H.

☐ Low-sloped Metal framed roofs in Climate Zones 3 and 5 are exempted solar reflectance and thermal emittance or SRI that have a U-factor of 0.048 or lower. See Opaque Surface Details roof assembly below, Column H.

☐ The roof area covered by building integrated photovoltaic panels and building integrated solar thermal panels are exempted solar reflectance and thermal emittance or SRI.

☐ Roof constructions with thermal mass over the roof membrane with a weight of at least 25 lb/ft<sup>2</sup> is exempted from the Cool Roof criteria.

CRRC Product ID Number <sup>1</sup>	Roof Slope		Product Weight		Product Type <sup>2</sup>	Aged Solar Reflectance <sup>3,4</sup>		Thermal Emittance	SRI <sup>5</sup>
	≤ 2:12	> 2:12	< 5lb/ft <sup>2</sup>	≥ 5lb/ft <sup>2</sup>					
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> <sup>4</sup>			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> <sup>4</sup>			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> <sup>4</sup>			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> <sup>4</sup>			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> <sup>4</sup>			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> <sup>4</sup>			

1. The CRRC Product ID Number can be obtained from the Cool Roof Rating Council's Rated Product Directory at [www.coolroofs.org/products/search.php](http://www.coolroofs.org/products/search.php)

2. Indicate the type of product is being used for the roof top, i.e. single-ply roof, asphalt roof, metal roof, etc.

3. If the Aged Reflectance is not available in the Cool Roof Rating Council's Rated Product Directory then use the Initial Reflectance value from the same directory and use the equation  $(0.2 + 0.7(p_{\text{initial}} - 0.2))$  to obtain a calculated aged value. Where  $p$  is the Initial Solar Reflectance.

4. Check box if the Aged Reflectance is a calculated value using the equation above.

5. Calculate the SRI value by using the SRI- Worksheet at <http://www.energy.ca.gov/title24/> and enter the resulting value in the SRI Column above and attach a copy of the SRI- Worksheet to the ENV-1C.

To apply **Liquid Field Applied Coatings**, the coating must be applied across the entire roof surface and meet the dry mil thickness or coverage recommended by the coatings manufacturer and meet minimum performance requirements listed in §118(i)4. Select the applicable coating:

☐ Aluminum-Pigmented Asphalt Roof Coating

☐ Cement-Based Roof Coating

☐ Other \_\_\_\_\_

# ENVELOPE COMPONENT APPROACH

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ENV-2C

Project Name:

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## Opaque Surface Details

For the furred portioned of Mass Walls see Furring Strips Construction Table below.

A	B	C	D	E	F	G	H	I	J
Proposed <small>See Note</small>				Standard	Values From JA4 Table				
Tag/ ID <sup>1</sup>	Assembly Name or Type <sup>1</sup>	Framing Material and Size <sup>2</sup>	Thickness, Spacing, or Other <sup>3</sup>	U- factor <sup>4</sup>	JA4 Table Number <sup>5</sup>	Framed Cavity R-value <sup>6</sup>	Continuous Insulation R-Value <sup>7</sup>	JA4 Assembly Cell Value <sup>8</sup>	Proposed Assembly U-factor <sup>9</sup>

Note: For furred assemblies use the Mass and Furring Strips Construction Table below. See Page JA4-3 &amp; Page JA4-5 for Equation 4-1 or 4-4.

1. For Tag/ID indicate the identification name that matches the building plans.
2. Indicate the Assembly Name or type: Roof/Ceiling, Walls, Floors, Slabs, Crawl Space, Doors and etc... Indicate the Frame type and Size: For Wood, Metal, Metal Buildings, Mass, enter 2x4, 2x6, or etc... see JA4 for other possible frame type assemblies.
3. Enter the thickness for mass in inches or Spacing between framing members enter; 16" or 24" OC; or Other for all other assembly description such as Concrete Sandwich Panel, Spandrel Panel, Logs, Straw Bale Panel and etc....
4. Based on the Climate Zone; enter the Standard U-factor from Table 143-A, B or C for each different assembly Name or type.
5. Enter the Table number that closely resembles the proposed assembly.
6. Enter the R-value that is being installed in the wall cavity or between the framing; otherwise, enter "0".
7. Enter the Continuous Insulation R-value for the proposed assembly; otherwise, enter "0".
8. Enter the row and column of the U-factor value based on Column F Table Number and enter the Assembly U-factor in Column J.
9. The **Proposed** Assembly U-factor, Column J, must be equal to or less than the **Standard** U-factor in Column E to comply.

## Furring Strips Construction Table for Mass Walls Only

A	B	C	D	E	F	G	H	I	J	K	L	M
Proposed Properties of Masonry and Concrete Walls From Reference Joint Appendix Table 4.3.5, 4.3.6, 4.3.7					Added Interior or Exterior Insulation in Furring Space from Reference Joint Appendix Table 4.3.13						Final Assembly U-factor <sup>6,7</sup>	Comment
Mass Thickness <sup>1</sup>	Assembly Name or Type <sup>2</sup>	JA4 Table Number <sup>3</sup>	JA4 - Mass Cell Value <sup>4</sup>	Mass U-Factor <sup>5</sup>	Insulation Layer Thickness	Frame Thickness	Frame Type Wood or Metal	Furring Cavity R-value <sup>3</sup>	JA4 - Mass Cell Value <sup>4</sup>	Effective R-value <sup>5</sup>		

1. Indicate the Mass Thickness from Reference Joint Appendix JA.
2. Indicate the Assembly Name or type: Roof/Ceiling, Walls, Floors, Slabs, Crawl Space, Doors and etc... Indicate the Frame type and Size: For Wood, Metal, Metal Buildings, Mass, enter 2x4, 2x6, or etc... see JA4 for other possible frame type assemblies.
3. Enter the Table number that closely resembles the proposed assembly.
4. Enter the row and column of the U-factor value.
5. Enter the Effective R-value listed in the JA4 Table Number.
6. The Final Assembly is calculated by using Equation 4-1 or Equation 4-4 of the Reference Joint Appendix JA4. Enter the value in Column L.
7. Insert the Final Assembly U-factor value back on to the Opaque Surface Details table in Column J.

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Project Name:					Date:		Climate Zone:						
<b>WEST WINDOW AREA CALCULATION</b> See §143(a)5A in the Energy Standards or Section 3.2.2													
A. <b>Gross West</b> Exterior Wall Area				<b>ft<sup>2</sup> × 0.40 =</b>		<b>ft<sup>2</sup></b>		40% Of <b>Gross West Facing</b> Exterior Wall Area; or					
B. <b>West</b> Display Linear Perimeter				<b>FT × 6 ft =</b>		<b>ft<sup>2</sup></b>		<b>West</b> Display Perimeter Area					
C. Enter Larger Of A Or B						<b>ft<sup>2</sup></b>		Maximum Standard <b>West</b> Area					
D. Enter Proposed <b>West</b> Window Area						<b>ft<sup>2</sup></b>		Proposed <b>West</b> Window Area					
<i>Note: If the PROPOSED <b>WEST</b> WINDOW AREA is greater than the MAXIMUM STANDARD <b>WEST</b> AREA then the envelope component approach may not be used.</i>													
<b>WINDOW AREA CALCULATION for all other orientations other than West -</b> See §143(a)5A in the Energy Standards or Section 3.2.2													
E. Gross Exterior Wall Area				<b>ft<sup>2</sup> × 0.40 =</b>		<b>ft<sup>2</sup></b>		40% Of Gross Exterior Wall Area or					
F. Linear Display Perimeter				<b>FT × 6 ft =</b>		<b>ft<sup>2</sup></b>		Display Perimeter Area					
G. Enter The Larger Of E or F						<b>ft<sup>2</sup></b>		Maximum Standard Area					
H. Enter Proposed Window Area						<b>ft<sup>2</sup></b>		Proposed Window Area					
<i>Note: If the PROPOSED WINDOW AREA is greater than the MAXIMUM STANDARD AREA then the envelope component approach may not be used.</i>													
<b>WINDOWS DETAILS §143(a)5B and C</b>													
<i>NOTE: For all newly installed fenestration; must have either a certified NFRC Label Certificate or use the CEC default tables found in Table 116-A and Table 116B and documented by using CECs Fenestration Certificate (FC-1/ FC-2). For site-built fenestration and less than 10,000 ft<sup>2</sup> or more than or equal to 10,000 ft<sup>2</sup> see options for compliance in the Nonresidential Manual in Section 3.1.</i>													
A	B	C	D	E	F	G	H	I	J	K	L	M	N
Window Name (e.g., Window-1)	Area <sup>1</sup>	Type <sup>2</sup>	Orientation	# of Panes	<b>Fenestration<sup>4</sup></b>				<b>Overhang</b>				
					U-Factor		SHGC Proposed	(R)SHGC Allowed <sup>1,3</sup>	Dimensions			(R)SHGC Proposed <sup>5</sup>	RSHGC <sup>3,4</sup> Allowed
					Proposed	Allowed <sup>3</sup>			H	V	H/V		
<i>Total Site-Built</i>				<i>Note: Site-built area is the sum of Site-Built Window and Site-Built Skylight Areas.</i>									
<i>Total Skylight Area</i>				<i>Enter Total Skylight Area from Skylight Details, Env-2C Page 4 of 4.</i>									
<i>Total Area</i>													
<ol style="list-style-type: none"> <li>1. Enter the area of each different fenestration product.</li> <li>2. Enter the type of fenestration; M=Manufactured, SB=Site-built, and F=Field Fabricated.</li> <li>3. The allowed U-factor and (R)SHGC values are from Table 143-A, B or C.</li> <li>4. If the Proposed window does not use an overhang then fenestration SHGC is treated the same as RSHG. Do not fill the overhang columns.</li> <li>5. For Relative SHGC; an overhang must extend beyond both sides of the window jamb a distance equal to the overhang projection.</li> <li>6. Use Equation 143-A, Relative Solar Heat Gain to calculate the RSHG for overhangs.</li> <li>7. Multiply the overhang factor (H/V) from RCM Table 3-6 with overhang SHGC, Column M, resulting the overhang RSHG value. Enter value in Max (R)SHGC on ENV-1C, Fenestration Surface, Page 1.</li> </ol>													

# **ENVELOPE COMPONENT APPROACH**

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Project Name:	Date:	Climate Zone:
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## **SKYLIGHT AREA CALCULATION** See §143(a)6A in the Energy Standards

	ACTUAL GROSS ROOF AREA		STANDARD ALLOWED SKYLIGHT AREA	
A IF Atrium/Skylight Height is $\leq 55$ ft; or		$\text{ft}^2 \times 0.05 =$	$\text{ft}^2$	
B. IF Atrium/Skylight Height is $> 55$ ft		$\text{ft}^2 \times 0.10 =$	$\text{ft}^2$	
C. Proposed Skylight Area		$\text{ft}^2$		
D. Skylight % = Proposed Skylight Area <u>Divided</u> by Actual Gross Roof Area =			%	

*If the PROPOSED SKYLIGHT AREA is greater than the STANDARD ALLOWED SKYLIGHT AREA then the Envelope Component Approach may not be used. The skylight percentage determines the appropriate row for the maximum U-factor allowed TO BE USED IN THE Skylight Details. See Table 143-A, B or C.*

## **SKYLIGHTS DETAILS** See §143(a)6 in the Energy Standards

A	SKYLIGHT GLAZING			E	F	G	U-FACTOR		SHGC	
	B	C	D				H	I	J	K
SKYLIGHT NAME (e.g., Sky-1, Sky-2)	Glass With Curb	Glass With No Curb	Plastic	Area <sup>1</sup>	Type <sup>2</sup>	# Of Panels	Proposed	Allowed <sup>3</sup>	Proposed	Allowed <sup>4</sup>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
<b>Total Skylight Area</b>					Enter above the Total Skylight Area in Window Details ENV-2C Page 3 of 4.					

1. Enter the area of each different skylight product.
2. Enter the type of skylight; M=Manufactured, SB=Site-built, and F=Fabricated.
3. The Allowed U-factor and SHGC values are from table 143-A, B or C. Use Row D Skylight % (from above) to select the allowed SHGC.
4. If the Proposed window does not use an overhang then fenestration SHGC is treated the same as RSHG.

## **RELOCATABLE PUBLIC SCHOOL BUILDINGS** - See §143(a)8 in the Energy Standards

### **Option 1**

<input type="checkbox"/> For Specific Climate Zone, use Table 143-A - Prescriptive Envelope Criteria.	<input type="checkbox"/> Specific Climate Zone Metal Identification Label – Place two labels on each relocatable school building and indicate on the building plans. <b>Indicate location on the building plans:</b>
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### **Option 2**

<input type="checkbox"/> For Any (All) Climate Zone, use Table 143-C - Prescriptive Envelope Criteria.	<input type="checkbox"/> Any (All) Climate Zone Metal Identification Label - Place two labels on each relocatable school building and indicate on the building plans. <b>Indicate location on the building plans:</b>
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